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Canada
United States
Spruce Budworms
Program

Newsletter

NUMBER 35, JULY 1984

CANUSA-East and the SAF Meet in Burlington

The Society of American Foresters (SAF) dedicated its Region VI technical conference to an all-CANUSA program, held in Burlington, Vermont, April 24–26. The stated purpose of the conference was to present an opportunity for SAF members and other forest land managers in eastern North America to learn about state-of-the-art spruce-fir management around the budworm problem. Participants were eligible to receive 13.5 contact hours of credit toward the SAF forestry education certificate in Category 1.

Day 1: Tuesday, April 24.

After welcoming remarks by Leo C. Laferriere, commissioner of Vermont's Department of Forests, Parks, and Recreation, the microphone was turned over to Sandoz representative Temple Bowen. Temple introduced Jack Coster, who gave the welcoming address. Temple moderated the first session of the meeting, entitled "The Budworm Forest: An Appraisal." His first speaker was Al Gordon, from the Ontario Ministry of Natural Resources. Al's talk gave us a fascinating look at the old days — as in prehistoric times. Al showed on maps the farthest reaches of the primeval spruce-fir forest. We're talking Texas and Florida now. He described fossilized spruce and fir cones from which fell out fossilized seeds!

Alex Shigo, of the Northeastern Forest Experiment Station, spoke on stress and death in the spruce-fir forest. He explained CODIT, his theory of how trees compartmentalize the invasions of fungi that follow wounding. Gordon Mott, now a private consultant following a career with the Northeastern Forest Experiment Station in Orono, discussed the dynamics of the forest and budworm.

Ken Knauer, of the Forest Service's Washington office in Forest Pest Management, chaired a group of speakers on "Spruce Budworm: the Inventory Effect." Case histories were presented by John Witter (National Forests in Michigan), Mike Albers (Minnesota), Douglas Powell (Maine), and Rod Carrow (the Maritimes Provinces).

International Paper Company's Jerry Williams introduced speakers on salvage as a method for coping with budworm outbreaks. Tom Corcoran (University of Maine) discussed computerized mapping as applied to the salvage process. Dennis Bradley (North Central Forest Experiment Station) covered the use of inventory data for determining appropriate mixes of harvesting equipment — a topic closely related to the content of his recently published CANUSA Technical Bulletin. Steve Sinclair, from Virginia Polytechnic Institute and State University and another CANUSA author, discussed the salvage problem that centers around consumer non-acceptance of balsam fir.

Bob Talerico, former CANUSA-East research coordinator and now a consultant for MicroGeneSys, Inc., of West Haven, Conn., moderated the section on impacts of budworm outbreaks. Yvan Hardy, of Laval University in Quebec, led off with a discussion of his theories about the dynamics of spruce budworm epidemics. Walter Shortle, a coworker of Al Shigo's at the Northeastern Forest Experiment Station in Durham, New Hampshire, covered how to detect stress in spruce-fir in relation to site and mortality. The growth of spruce and fir under stress was the topic of Dale Solomon, from the Northeastern Forest Experiment Station at Orono. Dave MacLean, from the Maritimes Forest Research Centre at Fredericton, New Brunswick, wrapped up this section, and day one, with a historical summary of hazard-rating models of the past 30 years.

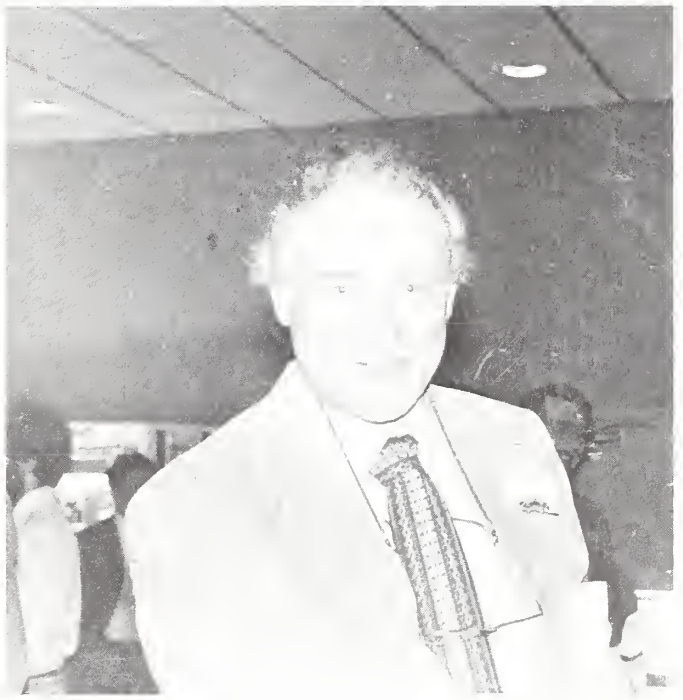

Figure 1. Gordon Stairs, wearing over his heart Temple Bowen's pink and green budworm insignia.

Day 2: Wednesday, April 25

Dan Kucera, from the Northeastern Area of State and Private Forestry in Broomall, hosted speakers on the subject of foliage protection. Errol Caldwell, of the Forest Pest Management Institute in Sault Ste. Marie, Ontario, discussed deposit and formula-

tion research at the Institute and summarized the status of chemical insecticides registered for use against the budworm. The Forest Service's new Center for Biological Control of Forest Insects and Diseases, at Hamden, Conn., sent long-time B.t. researcher Frank Lewis to summarize the lab's ongoing strain and formulation research. He mentioned Norm Dubois's discovery of the NRD–12 isolate, which is many times more toxic to budworm that the standard strain, HD–1. John Dimond, CANUSA author and professor at the University of Maine, discussed the spray window for maximizing the impact of spruce budworm insecticides.

At midmorning, the microphone changed hands again, with Dennis Souto (Forest Pest Management, State and Private Forestry) leading the discussion of advances in population monitoring. Dan Jennings, Northeastern Forest Experiment Station at Orono, reviewed the status of his automated egg-mass counter. This device is presently at the Forest Service's Missoula (Mont.) Equipment Development Center, undergoing some modifications and awaiting field-testing with this summer's new egg masses. E. A. Meighan, from McGill University, covered pheromone detection systems; and Chris Sanders, of the Great Lakes Forest Research Centre at Sault Ste. Marie, Ontario, outlined conceptual operation of a pheromone monitoring system. Cornell University's Jery Stedinger introduced population indexing as a possible alternative to foliage protection.

The day's final discussion session, led by Ed White, from the State University of New York at Syracuse, covered minimizing risk through forest management. Chuck Olson (University of Michigan) spoke on risk-rating procedures, and Michigan State's Gary Simmons discussed the effects of stand conditions on budworm dispersal. Hew Crawford, from the Forest Service's Orono office, described the effects of stand condition on bird predation of budworm. University of Vermont grad student Trish Hanson presented a paper on the effects of stand condition on parasite population dynamics.

The afternoon's activities wound up with Bart Blum (Forest Service, Orono) on silvicultural management to minimize budworm problems and Marie Rauter, from the Ontario Ministry of Natural Resources, speaking on converting stands to species that are not hosts for budworm.

In his keynote speech at Wednesday night's banquet, Brendan Whittaker, of Vermont's Agency of Environmental Conservation, highlighted the State's reaction to the threat posed by budworm. Brendan feels now is the time for Statewide control efforts where spruce budworm is active, through the use of B.t. and integrated pest management.

Day 3: Thursday, April 26

Dan Schmitt saved the best for last in programming the speakers. His special guest was Dean Haynes, an agricultural entomologist at Michigan State University for many years. Dean spoke on the dry-sounding topic of information systems and networking for pest management in agriculture. But nothing could have been less boring. He described the history of cereal leaf beetle spread throughout Michigan and the accidental creation, by one truck farmer, of an integrated pest management system for controlling the onion maggot. The photos of onion-maggot depredation in Michigan's garden district were shocking. This pest is thoroughly entrenched and causes crop losses that look like about 95 percent.

The truck farmer mentioned above suffered about the same losses as his neighbors — until he had a religious experience that led to his giving up the use of all chemical insecticides and fertilizers. For about 5 years, his onion fields were terrible, and then slowly, slowly, the populations of onion-maggot predators and parasites built up in response to high pest populations. Without chemical interference, these helpful organisms got a foothold, and rather suddenly the onion maggots subsided.

Before and after shots of this farmer's fields were amazing. Although not every grower could tolerate the reduced yields associated with organic farming, this man finds the no-pesticide, natural controls method of growing his crop to be morally satisfying and economically viable.

No one, least of all Dean Haynes, drew any heavy-handed conclusions about the possibility of managing spruce budworm through organic methods. But the speeded-up sequence of events in the onion farmer's fields suggests that annual spraying for budworm may be holding in check the natural parasites and insect predators that could partially regulate budworm populations if left to their own devices.

Bringing the symposium to its conclusion, Vermont's state forester, Ted Walker, chaired a panel discussion on managing spruce budworm in Vermont. Participants included Sam Hudson, Ron Reagan, Rich Carbonetti, Brad Wyman, Roy Whitmore, and Dennis Souto. They represented constituencies as various as the State's resource management agencies, the university sector, industry, and private consultant firms.

Microbial Control of Spruce Budworms and Gypsy Moths—Meeting Notes

The current status of microbial insecticides, recent progress, and future needs for research were among the topics explored during a microbial controls symposium held April 20–21, 1984, in Windsor Locks, Conn. The meeting was jointly sponsored by CANUSA-East and the Northeastern Forest Experiment Station (NEFES) of the USDA Forest Service. Though the program was highly technical, more than 125 forest pest management personnel, teachers, extension professionals, students, forest consultants, and land managers attended.

NEFES director Denver Burns gave the welcoming remarks, and long-time B.t. researcher Frank Lewis explained the purpose of the meeting.

The first section, "User Experiences—Good and Bad," was subdivided into topics concerning the spruce budworms and gypsy moth. Budworm speakers were H. J. Irving, H. Trial, L. Dorais, E. Kettela, and D. Kucera. "Gypsy moth–ers" included J. Nichols, T. Tigner, J. Kegg, and N. Schneeberger.

The second section, "Recent Field Research Experiences," was similarly subdivided. O. Morris, J. Dimond, W. Smirnoff, J. Cunningham, R. Soper, and A. K. A. Mohamed spoke about spruce budworms research on microbials. Gypsy moth research was summarized by N. Dubois, R. Weseloh, J. Podgwaite, and L. Abrahamson.

On Day 2, participants discussed new research developments, and what research is appropriate for the future. The speakers included N. Dubois, H. Gunner, P. Fast, M. Shapiro, K. Shields, M. Ma, and B. Carleton. Representatives of the microbial insecticide manufacturers presented summaries of new developments in commercially prepared biorationals. Abbott Labs sent R. Cibulsky; Biochem Products, J. Lublinkhof; Pfizer Labs, M. Hendricks; Reuters Labs, S. Hanna; and Zoecon Corporation, W. Beck. Temple Bowen of Sandoz was sighted briefly in the early going.

Figure 2. Jack Armstrong (at the podium) leads a discussion panel composed of (left to right) Michel Pelletier, Chet Himel, Jack Barry, Dave Smith, Bill Yendol, and Paul Fast.

On Wednesday afternoon, Jack Armstrong and Bill Yendol cochaired a discussion panel on the formulation and application of microbials for budworm and gypsy moth control.

The crowds had thinned by Thursday morning, when the wrapup session featured two discussion panels and an informal critique of the CANUSA Program. Topics were field-test design and data analyses, and standardization of bioassays and potency determinations. The latter topic was felt to be particularly important in view of recent variations in actual potency from labeled potency of B.t. Pete Orr, Northeastern Area, State and Private Forestry, and Frank Lewis of the Hamden, Conn., lab moderated the symposium conclusion.

A proceedings of this symposium will be published during the summer of 1984 and will be available from the Northeastern Forest Experiment Station, 370 Reed Road, Broomall, Pa 19008.

Proceedings of the CANUSA Symposium

Mrs. Joan Murphy, English editor at the Laurentian Forest Research Centre (LFRC), has been seconded to CFS Headquarters to act as Associate Editor of the Symposium Proceedings. Joan has had over 10 years experience at LFRC in the editing field, and is familiar with the budworm problem and the CANUSA Program. Copies of the Proceedings will be provided free of charge to all fully registered attendees at the Bangor meetings.

Joan reports that the response to the various components of the meetings (i.e., synthesis sessions, workshops, and posters) has been enthusiastic. Abstracts of all the posters have been scrutinized for scientific content, edited for format, and translated into French. They will be available for distribution to the delegates at the meetings. Workshop sessions are in various stages of completion, ranging from versions approved by the sessions chairpersons to advance information copies. Few of the synthesis papers have been edited because of the longer editorial route that ap-

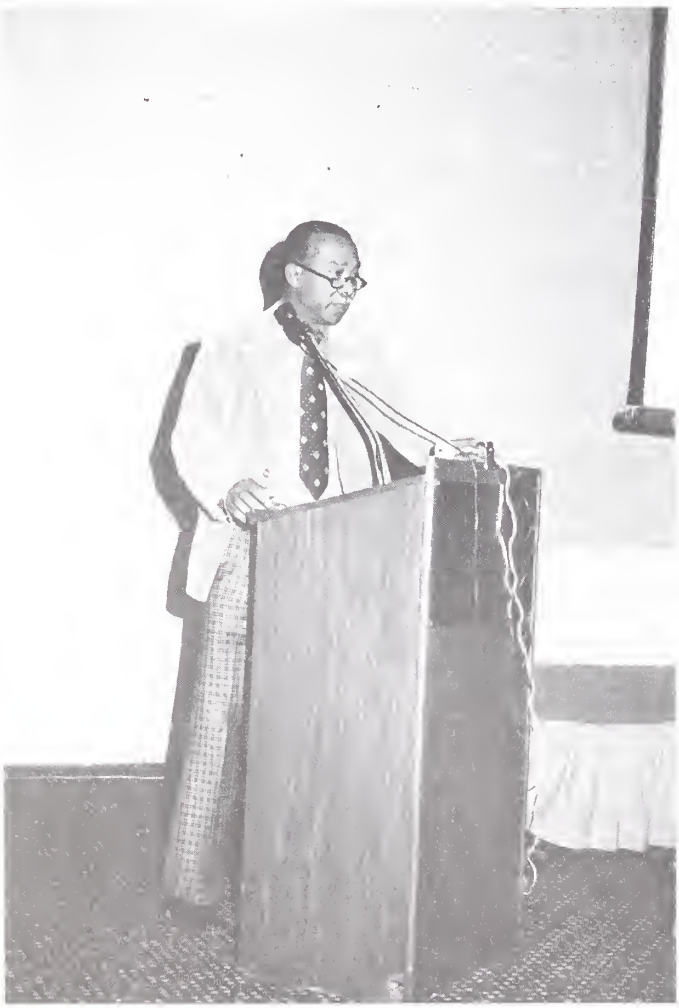

Figure 3. Ozzie Morris, now with Agriculture Canada in Winnipeg, has been a consistent contributor to our technology transfer efforts.

Figure 4. Larry Abrahamson, SUNY Syracuse, spoke on microbials for suppression of gypsy moth.

plies to them: they are being subjected to peer review, courtesy of the Entomological Society of America, the Society of American Foresters, and the Canadian Institute of Forestry.

It is expected that all authors will have the opportunity to meet and discuss the final versions of their contributions with Joan at the Symposium in September. A special editorial room has been allocated for the CANUSA staff for this purpose. Besides Joan, we are expecting attendance and assistance from Janet Searcy, Information Coordinator, in the Washington Office, Martha Brookes, US editor for the western Program and Jim Mullins, English editor at CFS Headquarters. Jim will assume responsibilities for the final editing and production of the Proceedings following the Symposium. With a staff of this competence, plus all the "behind the scenes" personnel, the chances of a quality product seem assured.

FIDS-PNFI Workshop

The Forest Insect and Disease Survey (FIDS) and the Petawawa National Forestry Institute (PNFI) of the Canadian Forestry Service are holding a joint workshop October 30–November 1, 1984 at PNFI to discuss how to obtain better forestry statistics from improved techniques of insect and disease survey and data management. The workshop will review the forest insect and disease survey techniques used today and then proceed to look at new technology and ideas which can be implemented to create a qualitative and quantitative data base on the nature of pest activity and its impact on the forest resource. The data base will better meet the information needs of researchers and managers. For more information contact:

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Forestry Institute
Environment Canada
Chalk River, Ontario
K0J 1J0
Tel: 995-7010 (819)

or

R. G. Taylor
Canadian Forestry
Service
351 St. Joseph's Blvd.
19th Floor
Ottawa, Ontario
K1A 1G5
Tel: 997-2269 (819)

Twelfth Annual Forest Pest Control Forum

The twelfth annual Forest Pest Control Forum will be held in Ottawa November 27–29, 1984, at the Government Conference Centre. The first two days will be devoted to a review of pest conditions and control and the third day to workshops. Please direct all enquiries to R. G. Taylor, Environment Canada, Canadian Forestry Service, 351 St. Joseph's Blvd., Ottawa, Ontario K1A 1G5. The telephone No. 997-2269 (819).

The Budworm in Newfoundland

Egg mass and overwintering larval surveys indicate that the budworm attack continues to cause light, moderate and severe defoliation in about 136 000 ha (336,000 acres) distributed in isolated patches throughout the southwest and west central parts of the Island. Moderate to severe defoliation occurred in about 55 000 ha (136,000 acres) of this area. Based on present tree conditions and defoliation in 1983, the area of moderate to high hazard in 1984 is forecast to be about 80 000 ha (197,700 acres).

In Labrador, moderate to severe defoliation occurred in about 1000 ha (2,471 acres) along Beaver River. The moderate to high hazard area is forecast to increase slightly to 1500 ha (3,700 acres).

Out and About

No new handbooks saw print between mid-March and mid-May, but the Program's two video tapes have been finalized and released. John Witter, Bruce Montgomery, and Mark Hummel, of The University of Michigan, scripted and produced the tapes under a contract through CANUSA-East with cooperative funding from CANUSA-West and CANUSA-Canada. "Forest Management and the Spruce Budworm," the eastern video tape, was shown in preliminary versions during the winter at various Program events. A final version came to Washington during April.

On May 29, "Reversing the Trend," the western video tape, arrived. A small group at the Spokane silviculture meeting saw an earlier version of this one and gave enthusiastic evaluations to John Witter and Bruce Montgomery on the spot.

The Program plans to buy enough copies of both tapes to supply government and private-sector users for the future. CANUSA-Canada is supervising the creation of a French translation and narration for each script. If there is sufficient demand, 16 mm films will be prepared from the ¾-inch video tapes so that users with the older technology can also show the material.

You will have the chance to see both tapes at the September 17–21 research symposium in Bangor.

Personnel

Congratulations to Ken Knauer, formerly of the Programs and Legislation wing of the USDA Forest Service in Washington. Ken has just been named assistant director of entomology and pathology programs for the Washington Office staff of Forest Pest Management, State and Private Forestry. Ken participated in the CANUSA critique last year and is now involved in reviewing the western component's three management manuals for the director of Forest Pest Management, Jim Stewart.

Errata

The Washington Office Information Coordinator apologizes to Jimmie Jon Colbert for countrifying his name to "Jimmie Joe" in the March issue of the *Newsletter*. But she refuses to take responsibility for calling Robert Ethington, Pacific Northwest Forest and Range Experiment Station director, "Bod" in the same issue. As we all know, Janet is not in any position to crack jokes about somatotypes. That should have been "Bob," Bob, and we're sorry.

Items from the Press

Spray program to cost $9.8-million.—The New Brunswick government will introduce a shift toward increased use of the bacterial agent BT and the chemical Matacil if its projected 1984 spruce budworm spray proposal is approved.

This year's considerably reduced spray program, expected to get under way about May 19, would treat 1,045 million hectares (2.5 million acres) of wooded land at an estimated cost of $9.8 million, Natural Resources Minister Gerald Merrithew announced Wednesday.

Details of the program, which is down by one-third or 500,000 hectares from 1983, were released by the minister at a morning press briefing and in the legislature later in the day. Formal approval for the operation must be given by the departments of Environment and Health, and required permits must be granted.

Tentative start date for the spraying will be May 19, depending on weather conditions, with three pesticides being used.

Two are chemicals — fenitrothion and Matacil — which will be mixed with Atlox or Dowanol and water and applied at the rate of 20 ounces of mix per acre. Merrithew said, that is equivalent to 2½ cups on an area about the size of a football field. More than 75 per cent of the applied mix is water, he said.

The third is the bacterial pesticide Bacilus Thuringiensis which will be applied to 40,000 hectares, compared with 10,000 in 1983, Merrithew announced.

The minister said the high costs of the bacterial agent are a major obstacle to larger scale use in the program, but an evaluation on the limited use last year shows it "provided satisfactory protection in most situations."

The major portion of the spray will cover Crown lands, private woodlots and small holdings, unless owners decide to opt out. It will involve use of the familiar TBM Avenger aircraft operated by Forest Protection Ltd. and small aircraft and helicopters.

The province pays the cost of treating Crown lands, private woodlots and lands owned by small forest industries, while large industries will pay the costs of treating their own freehold land.

He said the J. D. Irving Company has applied to the Department of the Environment for permission to spray its freehold, covering about 200,000 hectares. No other details are available since the company has not yet received a permit.

It is expected the Irving operation will use fenithrothion, the minister said.

Merrithew reported the costs of BT are high in spite of the fact that Forest Protection Ltd. this year made what it considers a good buy for the substance.

Using TBMs with large loads over Crown lands, he said, the chemical sprays cost $7.90 a hectare with BT costing $13.10. With smaller aircraft the comparative costs are $12.35 for chemicals and $17.30 for BT.

Merrithew said improved strains of the bacterial substance are being developed by manufacturers, and costs are likely to drop in the future.

The 1983 spray program covered 1.6 million hectares at a cost of $14.6 million. The minister said an inventory holdover from 1982 of $3 million dropped last year's net cost to $11.6 million.

Three major changes in the new program announced by Merrithew are:

- Introduction of Matacil on a large scale following limited use in 1983, which showed "excellent results." (Merrithew said an agency — Emifico— monitoring forest insect control operations has recommended expanded use).
- A major increase in the area sprayed with BT.
- A major shift towards targeted spraying — with many small blocks of woodland to be sprayed in the woodlot and industrial zones.

The small blocks, Merrithew said, represent 200,000 hectares, many of which have been replanted at a cost of several hundred dollars per hectare.

Setback zones from habitation where spraying is not permitted are 1.6 kilometres for large aircraft operations, 300 metres for helicopters and small aircraft, and 150 metres for small planes using BT.

At his press briefing, the minister acknowledged there appeared to be haste in announcing the program shortly after release of two task force reports dealing with the environment, cancer, and human reproductive problems.

"But time is against us," he said.

He said the government wishes to allow sufficient time for the public to notify officials if they want private lands sprayed or not, and to allow for permit processing by the other departments.

Merrithew coupled his detailing of the 1984 program with an overview of the need for spraying as part of forest management techniques to help conserve the ageing and budworm-riddled woodlands. The forests provide direct and indirect employment for 36,000 persons and recreational opportunities for countless others.

The majority of New Brunswick's forests are more than 60 years of age and are budworm-susceptible. New more budworm-resistant stands will take 40 to 50 years to mature, Merrithew said.

He said spraying is one aspect of good management which also includes replanting cutover areas, fire protection, and scheduled harvesting to clean out old, damaged stands first.

"Protection and preservation of this forest is in the best interests of hundreds of thousands of New Brunswickers," Merrithew said.

He reacted to claims of anti-spray groups that spraying can be eliminated by proper forest management. "We are practising good forest management and what I have described is good management."

Without spraying, the budworm will destroy trees and make it impossible to maintain wood supplies for the pulp and paper and sawmill industries, Merrithew said. Where spraying was stopped in southern New Brunswick in 1977 "the forests are to a large extent dead."

He said that, as of 1983, his department has assumed responsibility for surveying and assessing spray programs which has been done in the past by FPL and the Canadian Forestry Service. The latest evaluation shows that where spraying has been done "the forest is alive" and "the condition stable."

He said he and his staff are "vitally interested in the quality of life for their families," but "at present insecticides are the only available and effective tool we have to use against the spruce budworm."

(Times–Transcript–April 12, 1984)
Moncton, New Brunswick

Spray cited in blood disorder.—The spruce budworm spray program in the Lower St. Lawrence River area may be contributing to an above-average incidence of a disease that attacks the blood and kidneys, says a study released here this week.

From 1980 to 1982, the incidence of hemolytic and uremic syndrome among children up to 14 years old was 28 times higher in the Riviere-du-Loup region of Quebec, where chemical spraying is frequent, than in the Montreal suburb of Laval, the study says.

"There is a statistically significant relationship," Dr. Pierre Gosselin, one of the five scientists who conducted the research for the Rimouski Hospital's community health centre, said in a CBC radio interview yesterday.

During the three-year period covered by the study, 78 Quebec children contracted the syndrome, which is fatal in 4 to 5 per cent of cases. It can lead to kidney failure among those who survive.

The average incidence of the disease in Quebec as a whole is 1.86 cases per 100,000 children, but in the Riviere-du-Loup region the average is 13.99 cases per 100,000.

Dr. Gosselin said that while the incidence of the disease is higher for people who live near sprayed areas than for those who live farther away, exposure to the chemicals in the spray program — fenithrothion and matacil — is only one possible cause of the disease. Others include infection and genetic predisposition.

The authors of the study have recommended that people stay away from the forests, lakes and rivers in the spraying areas during spraying and for a time after it has been carried out.

Dr. Gosselin said the proportion of chemicals used in the Quebec budworm spray program is diminishing, with increasing reliance on safer biological agents.

(Globe and Mail–May 3, 1984)
Toronto, Ontario

Budworm.—Spruce budworm destruction in Nova Scotia will drop by half this year, but the threat posed by the pest will hang over the provinces's forests like Damocles' sword for decades, Forest Minister Ken Streatch warned in an interview.

The Minister also warned about the escalating danger of massive and dangerous forest fires in the dry, dead and dying forests of Cape Breton which have already been decimated by the budworm.

Mr. Streatch said the province will "take whatever measures are necessary" to prevent the same type of budworm destruction from falling on the mainland even if this means reassessing its ban of chemical pesticides.

(Chronicle–Herald–February 23, 1984)
Halifax, Nova Scotia

Spray program announced.—While saying the spruce budworm infestation is not a significant problem for the Newfoundland government and paper companies, Forestry Minister Charlie Power announced the provinces' annual spray program.

Power said 36,000 hectares of forests will be sprayed with the chemical insecticide Matacil. Of that amount, 4,800 hectares will be treated to provide information on the cumulative effects of spraying on selected segments of the environment, he said.

This year's total area is less than half of the 73,380 hectares treated last year.

Power said the spruce budworm is at a manageable stage. "While we got it down, we want to keep it down."

The province and paper companies will share the estimated $900,000 cost of the spray program. The industry will pay two-thirds of the total bill while the government will pay the rest.

(Daily Gleaner–February 21, 1984)
Fredericton, New Brunswick

New Brunswick spraying ends.—The $10 million budworm spray program ended on June 21st after spraying nearly one million hectares of New Brunswick forest.

A spokesman for Forest Protection Ltd. stated that all areas were treated as planned except for approximately 1,000 hectares which were deleted because the insect development was beyond the effective treatment stage.

In another case, several hundred thousand hectares received only one application at maximum dosage rather than two applications at light dosage.

(Daily Gleaner–June 22, 1984)
Fredericton, New Brunswick

Recent Publications

From the Northeastern Forest Experiment Station, 370 Reed Road, Broomall, PA 19008, you may request a copy of General Technical Report NE–88: "Proceedings: New and Improved Techniques for Monitoring and Evaluating Spruce Budworm Populations."

This report covers the content of the September 1983 meeting at Burlington, Vermont, sponsored by the Vermont Department of Forests, Parks, and Recreation; the USDA Forest Service, State and Private Forestry; and CANUSA. It contains articles on detecting new or incipient infestations, forecasting infestation intensity and damage, and pest-management strategy.

From the same address, you may receive General Technical Report NE–85, the proceedings of a CANUSA- and NEFES-sponsored meeting that took place in April of 1983 at New Haven, Conn. Bob Talerico and Michael Montgomery supervised production of "Proceedings: Forest Defoliator—Host Interactions: A Comparison Between Gypsy Moth and Spruce Budworms."

The Washington Office of the Forest Service has released an administrative report that may be of interest to some outside the Service. To get a copy of "Forest Insect and Disease Conditions in the United States, 1983," write to USDA Forest Pest Management, P.O. Box 2417, 204 RP–D, Washington, DC 20013. The 70-page processed manuscript tabulates the status of all major insect and disease pests active in the United States.

David Rumpf and Emanuel Melachrinoudis published "1984 Spruce Budworm Project Planned Using New Computer Model" in the May 1984 issue of *Agricultural Aviation* (p. 11 and 25).

Various reports and articles on spruce budworm have been published recently and are available from the following Canadian Forestry Service establishments:

From the Newfoundland Forest Research Centre, Box 6028, St. John's, Newfoundland A1C 5X8 you may request a copy of

Dobesberger, E. J., and K. P. Lim. "Population levels and biological mortality factors of spruce budworm in balsam fir stands in Newfoundland during 1982." Information Report N–X–218.

The Maritimes Forest Research Centre, P.O. Box 4000, Fredericton, N.B. E3B 5P7 has released Information Report M–X–149 by L. Magasi entitled "Forest Pest Conditions in the Maritimes 1983."

From the Great Lakes Forest Research Centre, Box 490, Sault Ste. Marie, Ont. P6A 5M7, reprints are available of

Sanders, C. J. "Sex pheromone of the spruce budworm (Lepidoptera: Tortricidae): Evidence for a missing component." Can. Entomol. 116:93–100. (1984).

Régnière, Jacques, and C. J. Sanders, "Optimal sample size for the estimation of spruce budworm (Lepidoptera: Tortricidae) populations on balsam fir and white spruce." Can. Entomol. 115:1621–1626 (1983).

Basham, J. T., "Degradation and loss of wood fibre in spruce budworm-killed timber, and effects on utilization." For. Chron. Feb. 1984, pp. 10–14.

And from the Forest Pest Management Institute, Box 490, Sault Ste. Marie, Ont. P6A 5M7, reprints are available of

Morris, O. N., "Comparative efficacies of single and double applications of commercial *Bacillus thuringiensis* against the spruce budworm *Choristoneura fumiferana* in balsam fir stands." Can. Entomol. 116: 101–102.

Wilson, G. G., "A dosing technique and the effects of sub-lethal doses of *Nosema fumiferanae* (Microsporida) on its host, the spruce budworm *Choristoneura fumiferana*." Parasitology 87:371–376.

Fast, P. G., and J. B. Dimond, "Susceptibility of larval instars of spruce budworm *Choristoneura fumiferana* (Lepidoptera: Torticidae) to *Bacillus thuringiensis*." Can. Entomol. 116:131–137.

Fast, P. G. and J. Régnière, "Effect of exposure time to *Bacillus thuringiensis* on mortality and recovery of the spruce budworm (Lepidoptera: Tortricidae)." Can. Entomol. 116:123–130.

In the Hopper

At presstime for this issue (mid-May), we had more publications irons in the fire than we could comfortably handle. Our printing specialists told us to expect shipment May 28 of Dennis Bradley's "Using Computer Simulation to Evaluate Mechanized Harvest Systems" (Technical Bulletin 1687). June 16 is the scheduled release date for John Dimond's "Planning Insecticide Application and Timber Harvesting in a Spruce Budworm Epidemic" (Ag. Handbook 618). This manual includes color photographs, and the printer requested extra time to ensure high quality. If you're on the regular distribution list to receive CANUSA publications, your copy of each of these handbooks should have arrived by the time you read this. If not, contact the publications distribution center at the Northeastern Forest Experiment Station, USDA Forest Service, 370 Reed Road, Broomall, PA 19008. Their telephone numbers are (215) 461–3106 or FTS 489–3106.

Bob Marty's "Guide to Economic Evaluation of Spruce Budworm Management Opportunities in the East" (Ag. Handbook 627) reached the galley proof stage in late May, but the typesetter accidently failed to return to us a middle sheet of proof for checking. Running down the location of the missing sheet required a full 2 weeks!

The long-awaited Ozzie Morris-John Dimond-Frank Lewis manuscript on using B.t. should be at the printer's by the time you read this. Corrected reproduction proof of "Guidelines for the Operational Use of B.t. Against the Spruce Budworm" (Ag. Handbook 621) was returned to our printing specialists in the middle of May.

"Managing the Spruce Budworm in Eastern North America" (Ag. Handbook 620) got bogged down in typesetting during the spring, but it recently took a big step forward when the design contract was let in record time (1 day). Despite the book's length (over 300 manuscript pages) and complexity, the designer assured us that the flats could be prepared in 3 weeks. If this step is completed on time, the book should be ready to go to the printer's by the end of July. Hopefully, the eastern management manual will be published by October.

Gary Fowler and Gary Simmons, of Michigan State University, gave us a new manuscript in May: "Sampling Procedures for Spruce Budworm Egg-Mass Surveys (with Reference to the Lake States)." This proposed Agriculture Handbook is presently out for Washington Office Staff review.

Steve Sinclair and Doug Barnes's "Balsam Fir: Its Properties and Utilization" (Ag. Handbook 629) reached the galley proof stage just before Memorial Day. The typesetter did a fine job on this text, and we expect it to proceed promptly through the other stages of production. Late-summer publication is anticipated.

The Dave Tilles-Norman Woodley manuscript "Spruce Budworm Parasites in Maine: A Reference Manual for Collection and Identification of Common Species" has run into trouble at the layout stage. We are in the process of having this manuscript retypeset to incorporate a number of late but scientifically justified changes in taxonomy. The book contains two insect keys, which are a special problem for typesetters not familiar with the standard format for keys. We now estimate that Agriculture Handbook 616 will be printed in late summer.

The western component of CANUSA has been running behind the easterners in producing their handbooks, but April and May saw many welcome changes in the status of western publications. Dick Reardon's text (Ag. Handbook 625) on the use of Medicaps and Maugets containing acephate to protect individual trees against western spruce budworm reached the galley proof stage in mid-May. So did Larry Stipe's "Ground Spray Techniques to Reduce Damage from Western Spruce Budworm" (Ag. Handbook 624) and Dan Twardus's "How to Separate Old and New Egg Masses of the Western Spruce Budworm" (Ag. Handbook 623). All three manuals should be printed in time for display at the Bangor symposium.

Steven Shattuck's "Illustrated Key to Ants Associated with the Western Spruce Budworm" came to the Washington Office in late April and went out for Staff review during May. The text will be typeset this summer, and we predict early fall delivery.

CANUSA-West's computer modelling team has run into difficulties with the spruce budworm model and its links with Prognosis, the stand-development model. Accordingly, the westerners have postponed a number of model-related publications into Fiscal Year 1985. These handbooks, by Nick Crookston, Kathy Sheehan, and Tom Bible, will definitely be published—it's just a question of when.

But on the western good-news front, Bob Stevens and Val Carolin's Ag. Handbook (622) "Lepidoptera Associated with Western Spruce Budworm" has reached the reproduction proof stage. Summertime delivery of this colorful (50-odd plates) book is likely.

Thomas Swetnam and his associates Marna Ares Thompson and Elaine Kennedy Sutherland have prepared a manuscript that is a welcome, if unexpected, addition to the CANUSA-West family of books. Their proposed Agriculture Handbook "Measuring Radial Growth Reduction in Defoliated Trees Using Dendrochronology" presents detailed

techniques for measuring the impact of insect defoliators, particularly western spruce budworm, on the radial growth of damaged trees. The manual describes field and lab procedures for collecting and preparing increment cores, techniques for standardizing and developing tree-ring chronologies, and methods for estimating growth reduction by comparing host and nonhost chronologies. This manuscript is presently being reviewed in the field for taxonomic validity and will be submitted for production by late summer.

April may be the cruelest month for T.S. Eliot, but it was a fine one for CANUSA-West: they submitted their three management manuals to the Washington Office for Staff review. These proposed Technical Bulletins were held up in the rewrite/field review stages but have now been released for production. Program Management in Portland will spend a good part of June incorporating the comments of several Staffs into a final draft of each book. By the time you read this, "Western Spruce Budworm," "Managing Trees and Stands Susceptible to Western Spruce Budworm," and "Western Spruce Budworm and Forest-Management Planning" should be out for typesetting.

To get more information or to have your name added to the mailing list for the *Newsletter*, contact

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